Status of the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (Previously Presented) A lithographic apparatus, comprising:

an illumination system that supplies a beam of radiation;

a patterning system that imparts the beam with a pattern in its cross-section;

a projection system that projects the patterned beam onto a target portion of a surface of a substrate;

a temperature measuring system that measures a respective temperature of a plurality of regions of the substrate;

a calculating system that calculates a dimensional response of the substrate to the respective measured temperature; and

an adjusting system that adjusts spatial characteristics of the patterned beam to compensate for the calculated dimensional response, wherein the adjusting system comprises an image correction system to adjust a cross-sectional shape of the beam.

2. (Previously Presented) The apparatus according to claim 1, wherein the temperature measuring system comprises:

at least one sensor that measures the temperature of the substrate at each of the plurality of regions distributed across the surface of the substrate.

3. (Previously Presented) The apparatus according to claim 1, wherein the temperature measuring system comprises:

sensors distributed across a substrate support.

4. (Original) The apparatus according to claim 3, wherein each of the sensors senses the temperature of an adjacent region of the substrate.

5. (Original) The apparatus according to claim 3, wherein each of the sensors senses the temperature of an adjacent region of the substrate support.

6. (Previously Presented) The apparatus according to claim 1, wherein the temperature measuring system comprises:

sensors distributed on a sensor support positioned above a substrate support; and

a scanning system that is arranged to displace the substrate support relative to the sensors and to measure the temperature of regions of the substrate adjacent each of the sensors at each of a plurality of relative positions between the substrate support and the support.

7. (Original) The apparatus according to claim 6, wherein the sensors are supported on a stationary frame beneath which the sensor support is displaceable.

8. (Original) The apparatus according to claim 6, wherein the sensors are supported in a linear array extending transversely relative to a direction in which the substrate support is displaceable.

9. (Previously Presented) The apparatus according to claim 1, wherein:

the temperature measuring system comprises a substrate temperature mapping system that develops a map representative of the temperature at a plurality of regions of the substrate,

the calculating system comprises a system that develops a model of the dimensional response of the substrate in a substrate support coordinate system, and

the spatial characteristic adjusting system comprises a system that develops a map of a change in position of points on the substrate relative to the substrate support coordinate system given the mapped temperature at the plurality of regions of the substrate and the dimensional response model and a system for adjusting spatial characteristics of the patterned beam in accordance with the change in position map to compensate for the calculated dimensional response.

10. (Cancelled)

11. (Previously Presented) The apparatus according to claim 1, wherein the adjusting system further comprising:

a beam alignment adjustment system that adjusts the position of the patterned beam relative to the substrate support.

12. (Previously Presented) The apparatus according to claim 1, wherein the adjusting system further comprising:

a beam magnification adjustment system that adjusts a size of the patterned beam.

13. (Previously Presented) A device manufacturing method, comprising:

emitting a beam of radiation using an illumination system;

imparting to the beam a pattern in its cross section;

projecting the patterned beam of radiation onto a target portion of a surface of a substrate;

measuring a respective temperature of a plurality of regions of the substrate;

calculating a dimensional response of the substrate relative to the respective measured temperature; and

adjusting one or more spatial characteristics of the patterned beam relative to a substrate support to compensate for the calculated dimensional response, wherein the spatial characteristics comprise a cross-sectional shape of the patterned beam, a position of the patterned beam, and a size of the patterned beam.

14. (Previously Presented) The method according to claim 13, wherein the temperature is measured at the plurality of regions distributed across the surface of the substrate.

15. (Original) The method according to claim 13, wherein the temperature is measured with a plurality of sensors distributed across the substrate support and each of the plurality of sensors sense the temperature of an adjacent region of the substrate.

16. (Original) The method according to claim 15, wherein:

the plurality of sensors are distributed on a sensor support located above the substrate support;

the substrate support and the plurality of sensors are displaced relative to each other; and

the temperature of regions of the substrate adjacent each of the plurality of sensors are measured at each of a plurality of relative positions between the substrate support and the sensor support.

17. (Original) The method according to claim 16, wherein the plurality of sensors are supported on a stationary frame located above the substrate support and the substrate support is displaced beneath the frame.

18. (Original) The method according to claim 17, wherein the substrate support is displaced in a predetermined direction and the sensors are supported in a linear array extending transverse to the said direction.

19. (Previously Presented) The method according to claim 13, further comprising:

generating a map of the temperature across the substrate;

developing a model of the dimensional response of the substrate in a substrate-support coordinate system;

generating a substrate position map that represents a change in position of points on the substrate relative to the substrate support coordinate system given the map of the temperature across the substrate and the model of the dimensional response; and

adjusting the spatial characteristics of the patterned beam in accordance with the substrate position map to compensate for the dimensional response.

20-22. (Cancelled)

23. (Previously Presented) A method, comprising:

measuring a first set of temperatures, wherein each temperature corresponds to the temperature at a first different respective regions of a substrate;

forming a first pattern of alignment features at the first different respective regions of the substrate having the measured first set of temperatures during an exposure of the substrate;

measuring a first set of spatial distributions of the first pattern of alignment features of the substrate occurring during the first set of temperatures;

measuring a second set of temperatures, wherein each temperature in the second set corresponds to a second different one of the respective regions of the substrate;

forming a second pattern of alignment features at the second different respective regions of the substrate having the measured second set of temperatures during a subsequent exposure of the substrate;

measuring a second set of spatial distributions of the alignment features occurring during the second set of temperatures; and

determining a dimensional response from differences between measurements of the first set of spatial distributions and measurements of the second set of spatial distributions.

24. (Original) The method according to claim 23, wherein:

the substrate is a reference substrate which is one of a class of substrates having similar physical characteristics and which are to be processed in a lithographic apparatus;

the spatial distribution of the alignment features of the reference substrate is measured when the reference substrate is supported on a substrate support of the lithographic apparatus;

a member of the class of substrates is subsequently placed on the substrate support;

the temperature of the substrate supported on the substrate support is measured at each of a plurality of regions distributed across a substrate surface; and

processing of the substrate is adjusted based on correlating a change in the substrate dimensions with a dimensional response model derived from the reference substrate.

25. (Cancelled)

26. (Cancelled)

27. (Previously Presented) The method according to claim 23, further comprising:

causing the first and second patterns to have a same nominal spatial distribution with a nominal offset between the two patterns; and

deriving the dimensional response model from differences between nominal and measured offsets between features of the two patterns.

28. (Previously Presented) The method according to claim 23, further comprising:

forming the first pattern on a reference substrate that is one of a class of substrates having similar physical characteristics and which are to be processed in a lithographic apparatus;

forming the second pattern on the reference substrate by exposing a layer of resist supported on the reference substrate in the lithographic apparatus;

measuring the differences between the nominal and measured offsets within the lithographic apparatus; and

washing the exposed resist off the reference substrate to enable re-use of the reference substrate.